RIODICAL ROOM
NERAL LIBRARY
NIV. OF MICH.
APR 14 1924

# SCIENCE

NEW SERIES
VOL. LIX, No. 1528

FRIDAY, APRIL 11, 1924

ANNUAL SUBSCRIPTION, $6.00
SINGLE COPIES, 15 CTS.


# BLAKISTON HEALTH BOOKS

## Industrial Health—Kober and Hayhurst

An illustrated treatise on the general principles of maintaining health in industry; vocational hygiene of certain industries and callings; specific occupational diseases with hygienic description of the industries in which they occur; systemic occupational diseases; industrial health administration. By 33 contributors with special experience in some branch of the subject treated. Edited by George M. Kober, M.D., LL.D., Washington, and Emery R. Hayhurst, A.M., M.D., Ph.D., Columbus, Ohio. With illustrations, tables and appendix. 8vo. Cloth, $15.00.

## Public Health Administration—Luckett and Gray

A Manual which should have a very definite place in the field worker's library and for use as a text-book. It gives a good, modern perspective of the whole subject. By George Sparr Luckett, A.B., M.D., Director of Public Health, New Mexico, and Harold Farnsworth Gray, B.S., M.S., Gr.P.H., New Mexico Bureau of Public Health. 12mo. Cloth, $3.00.

## Hygiene and Public Health—Parkes and Kenwood

Seventh Edition, Revised. A practical volume covering the modern public health and hygiene, widely used for reference. By L. C. Parkes, M.D., D.P.H., University of London, and Henry R. Kenwood, C.M.G., M.B., University of London. With 90 illustrations. Cloth, $7.00.

## Health of the Industrial Worker—Collis and Greenwood

This volume presents special experience in industrial health work; reclamation of the disabled; fatigue; research findings, etc. By Edgar L. Collis, M.D., M.R.C.P., Professor of Preventive Medicine, Welsh National School of Medicine, England, and Major Greenwood, M.R.C.P., Member of Industrial Fatigue Research Board, London, assisted by Arthur J. Collis, M.D., England, and with an Introduction by Sir George Newman, K.C.B., M.D., London. 38 Illustrations. Cloth, $7.00.

## Practical Bacteriology, Blood Work, Parasitology—Stitt

Seventh Edition. With Bacteriological Keys and Explanatory Clinical Notes. A modern working Manual. By E. R. Stitt, M.D., Surgeon General, U. S. Navy. With 203 Illustrations. Cloth, $5.00.

## Types of Mental Defectives—Barr and Maloney

A reference guide to the distinctive points in the various classes of defectives, which shows clearly the way to diagnosis and classification of the different types. By M. W. Barr, M.D., and E. F. Maloney, A.B., Philadelphia. With 31 plates. 8vo. Cloth, $3.00.

P. BLAKISTON'S SON & COMPANY

PUBLISHERS PHILADELPHIA

# Birds and Mammals

Skeena River Region

## Northern British Columbia

By HARRY M. SWARTH

80 pages, 3 plates, 1 figure in text, $1.00

---

## Birds from Patagonia

List of New Subspecies

By ALEXANDER WETMORE

Price, 25 cents

---

## University of California Press

Berkeley, California



# SMITHSONIAN INSTITUTION

## THE WALTER RATHBONE BACON SCHOLARSHIP

The Secretary of the Smithsonian Institution has approved the rules which are to regulate the award of the Walter Rathbone Bacon Scholarship for the study of the fauna of countries other than the United States of America. The amount available is the interest on the capital invested (about $2,400 a year) the incumbent to hold the scholarship not less than two years.

Applications for this scholarship, addressed to the Secretary of the Smithsonian Institution, should be submitted not later than June 1, 1924. The application should contain a detailed plan for the proposed study including a statement as to the faunal problems involved; the reasons why it should be undertaken; the benefits that are expected to accrue; the length of time necessary for the carrying out of the project; the estimated cost; and the scientific and physical qualifications of the applicant to undertake the project.

The scholarship will be awarded for a term of two years. If at the expiration of the term it is desired to extend the time, the incumbent shall make application a sufficient time in advance, accompanied by a statement as to the necessity for such extension.

All collections, photographs, records and equipment become the property of the Institution.

The incumbent shall not engage in work for remuneration or receive salary from other sources than the Institution or its branches during the period of this occupancy of the scholarship.

For any further information, address the Secretary, Smithsonian Institution, Washington, D. C.



# The Cambridge University Press, England

### THE AIR AND ITS WAYS

**By NAPIER SHAW**

"Indispensable to everyone who proposes to try to understand the physics of the atmosphere."—*The London Times Literary Supplement.*

*Illustrated.* $10.50

---

### BASIC SLAGS AND ROCK PHOSPHATES

**By G. S. ROBERTSON**

"Never before have we had the story of basic slags and rock phosphates in connection with soil fertilization so thoroughly told as in this work."—*The Land Agent's Record.* *Illustrated.* $4.50

### BRITISH BASIDIOMYCETAE

**By CARLETON REA**

"Admirably written . . . *the* authority for those making a special study of this group of larger fungi."—*Aberdeen Journal.* $10.00

---

### THE GEOLOGY OF THE METALLIFEROUS DEPOSITS

**By R. H. RASTALL**

"The author has searched the world for his examples, and has produced a treatise which will take a front place in the geological literature of the day."—*Mining World and Engineering Record.*

*Illustrated.* $7.00

## For sale by THE MACMILLAN COMPANY, American Agents

**64-66 Fifth Avenue, New York**
**Prairie Ave. & 25th Street, Chicago**
**Huntington Chambers, Copley Square, Boston**
**350 Mission Street, San Francisco**
**330 South Harwood Street, Dallas**
**17 Houston Street, Atlanta**

# SCIENCE

VOL. LIX APRIL 11, 1924 No. 1528

CONTENTS

*Presentation of the Nobel Prize to Robert A. Millikan:* ALLVAR GULLSTRAND ..... 325

*Genetics and Plant Taxonomy:* PROFESSOR E. B. BABCOCK ..... 327

*Investigations concerning Imported Biological Stains:* DR. H. J. CONN ..... 328

*Scientific Events:*

*Paul Ehrlich; The American School of Prehistoric Research; The Cold Spring Harbor Biological Laboratory; The Forest Research Council; The Physical Society of London; Dinner in Honor of Mr. Garvan* ..... 331

*Scientific Notes and News* ..... 333

*University and Educational Notes* ..... 336

*Discussion and Correspondence:*

*Paleobotany at the New York State Museum:* PROFESSOR EDWARD W. BERRY. *The Infection of Tobacco Plant Beds by Spitting:* W. D. VALLEAU. *Mercuric Chloride as a Preventive of Certain Damping-off Fungi:* HUGH GLASGOW and W. O. GLOYER ..... 336

*Scientific Books:*

*Fisher on Frequency Curves and their Application:* PROFESSOR EDWIN B. WILSON. *Stejneger and Barbour's Check List of North American Amphibians and Reptiles:* PROFESSOR ALEXANDER G. RUTHVEN ..... 338

*Laboratory Apparatus and Methods:*

*The Emanation Method for Radium:* DR. FRANK E. E. GERMANN. *Use of the Binocular Microscope:* DRS. GEORGE H. NEEDHAM and CARL R. FELLERS ..... 340

*The American Association for the Advancement of Science:*

*Financial Report of the Permanent Secretary:* PROFESSOR BURTON E. LIVINGSTON. *Report of the Treasurer. Report of the Secretary-treasurer of the Pacific Division:* W. W. SARGEANT ..... 342

*Science News* ..... x

**SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. McKeen Cattell and published every Friday by**

**THE SCIENCE PRESS**

**Lancaster, Pa. Garrison, N. Y.**

**New York City: Grand Central Terminal.**

**Annual Subscription, $6.00. Single Copies, 15 Cts.**

**SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the association may be secured from the office of the permanent secretary, in the Smithsonian Institution Building, Washington, D. C.**

**Entered as second-class matter July 18, 1923, at the Post Office at Lancaster, Pa., under the Act of March 3, 1879.**

## PRESENTATION OF THE NOBEL PRIZE TO ROBERT A. MILLIKAN[1]

THE Royal Academy of Sciences has awarded this year's Nobel prize for physics to Dr. Robert Andrews Millikan for his work on the unit of electrical charge and on photoelectric effect.

We speak of an electric charge when electricity is accumulated on a body, and of an electric current when it spreads along a metallic wire. But when electricity passes through water or water solutions there is no current in the same sense of the word: there is a convection of charges combined with chemical decomposition—electrolysis. Thus water is decomposed into its constituents, hydrogen and oxygen, and metallic silver is deposited from solutions of silver salts. If one and the same current is used to cause these decompositions, the weight of hydrogen liberated in a certain time bears the same ratio to the weight of silver deposited as the atomic weight of hydrogen to the atomic weight of silver, and a current of a given strength in a given time always causes the appearance of a constant quantity of hydrogen and the depositing of a corresponding quantity of silver. As the strength of the current indicates the quantity of electricity passing through the fluids in a given time, it follows that the hydrogen atom and the silver atom carry the same charge, and this charge is what is meant by the unit of electric charge. The same laws hold good for all electrolytic processes, different atoms carrying as many units as are indicated by their valency. The charged atoms are called ions, but this word is also used in a wider signification.

It follows from these laws of electrolysis that it was possible to calculate the unit of electric charge with the same degree of probability with which the number of atoms in a gram of hydrogen could be estimated, and as early as 1874 an approximate value of the unit was arrived at in this way, equalling about two thirds of the exact value now known through the researches of Millikan. The word electron was proposed later as a name for the unit of charge, but now that the discovery of cathode rays has brought to our knowledge free units of negative electricity an electron

[1] Address of the president of the Nobel committee of physics, Royal Academy of Sciences of Stockholm, on presentation by the king of Sweden to the U. S. minister of the Nobel prize in physics, Stockholm, December 10, 1923.

means an amount of negative electricity equalling the unit of charge.

Electricity does not pass through gases under normal conditions, but when a gas is exposed to X-rays it acquires the power of transmitting a current. It was soon proved that under the influence of these rays positive and negative ions are formed, conveying charges of electricity in the same way as in the case of electrolysis. The discovery of radioactive elements provided still more powerful means for such an ionization of gases.

With the methods that were now available it could be shown that the unit of charge of the gas ions was approximately the same as the unit known from electrolysis. Ionization was also observed in monatomic inert gases; which proves that the unit of electric charge is a constituent of the atom that is liberated from it by ionization. Eager attempts were now made to obtain a more exact value for the unit of charge, but the results were not much better than before, until Millikan took up the problem.

Millikan's aim was to prove that electricity really has the atomic structure which, on the basis of theoretical evidence, it was supposed to have. To prove this it was necessary to ascertain, not only that electricity, from whatever source it may come, always appears as a unit of charge or as an exact multiple of units, but also that the unit is not a statistical mean, as, for instance, has of late been shown to be the case with atomic weights. In other words, it was necessary to measure the charge of a single ion with such a degree of accuracy as would enable him to ascertain that this charge is always the same, and it was necessary to furnish the same proofs in the case of free electrons. By a brilliant method of investigation and by extraordinarily exact experimental technique Millikan reached his goal.

In his fundamental experiments he had two horizontal metal plates, one a short distance above the other, and by means of a switch he could join them with the poles of a source of high tension current or shortcircuit them. The air between the plates was ionized by radium that could be screened off. There was a minute pinhole in the middle of the top plate, and over it he had arranged a spray of oil droplets with a radius of about one thousandth of a millimeter. Sooner or later such an oil droplet must fall through the pinhole and enter the space between the plates, where it was illuminated in such a way that Millikan could see it in a telescope like a bright star on a black background. In the eyepiece of this telescope were placed three cross-hairs, and Millikan measured the time which the droplet required to pass between them. In this way he measured the velocity of fall, which for such small droplets is only a fraction of a millimeter a second. The droplet had been charged with electricity by the frictional process involved in blowing the spray, and when it had fallen down Millikan switched on the source of current so as to cause the drop to be pulled up by the attraction of the upper plate. The droplet rose, and its velocity was measured during its rise; then the plates were shortcircuited, and the drop turned again and began to fall. In this way he kept the drop travelling up and down, many times during several hours, and measured its velocity again and again by means of a stop-watch, or, later, a chronoscope. The velocity of fall was constant, but on the way up the velocity varied, which means that the drop had captured one or more of the ions spread in the air between the plates. Now in this experiment the difference of velocity is proportional to the charge captured, and the results showed that the difference of velocity always had the same value or an exact multiple of that value. In other words, the drop had caught one or more units of electrical charge, all exactly equal, however the experiments were varied. In this way the charge of a single ion could be measured in a very large number of cases, and it was determined with an exactitude of one in a thousand.

When the source of current is switched on, the positive ions are driven with a high speed towards the negative plate, and *vice versa*. Thus Millikan only needed to have the droplet near one of the plates at the moment when he switched on the source of current, if he wished to expose it to a swarm of positive or negative ions and in this way alter its charge. By this method he proved that the electric charge which the drop had acquired by friction was an exact multiple of the unit.

To give unimpeachable proof Millikan was obliged to make similar experiments with cathode rays and with alpha- and beta-rays and, moreover, to investigate the law of fall of small bodies through gases and the law of their Brownian movements.

Even leaving out of consideration the fact that Millikan has proved by these researches that electricity consists of equal units, his exact evaluation of the unit has done physics an inestimable service, as it enables us to calculate with a higher degree of exactitude a large number of the most important physical constants.

In justifying the reward of Millikan the academy has not omitted to refer also to his investigations of photoelectric effect. Without going into details I will only state that, if these researches of Millikan had given a different result, the law of Einstein would have been without value, and the theory of Bohr without support. After Millikan's results both were awarded a Nobel prize for physics last year.

ALLVAR GULLSTRAND

## GENETICS AND PLANT TAXONOMY

THE possibility that genetical experiments may be of direct service to plant taxonomists does not seem to be appreciated. Even among those systematic botanists who encourage such experiments, when done by geneticists for genetical purposes, there are few who consider it worth while to resort to genetical methods themselves. Yet the solution of such problems as the limits of species and phylogenetic relationships may often be assisted by the simplest methods of plant breeding, such as selection of biotypes followed by inbreeding and the crossing of biotypes.

The writer has been impressed with evidence thus secured which bears on the phylogenetic relationship between certain subspecies of Hemizonia. By inbreeding strains of one of these subspecies, forms were obtained in the third garden generation which closely resembled a distinct but related subspecies. The first would thus appear to be the older of the two subspecies in question, and this is in harmony with certain morphological differences between them. This appeals to the writer as an argument for keeping the two in one species, and the evidence from crossing supports this argument. They cross readily and are completely interfertile. The $F_1$ hybrid plants are intermediate and uniform in their characters, while the $F_2$ generation is also intermediate between the grandparental types but shows great variation in many characters. The two subspecies, therefore, must differ with respect to numerous genetic factors, but this does not necessarily remove them from the category of subspecies, while the evidence from inbreeding certainly favors such a classification.

But the service of genetics to taxonomy is not limited to the analysis of single species. Hybridization experiments involving several Linnaean species of Crepis have brought to light certain very suggestive facts bearing on their phylogeny. For example, two species supposed to be very closely related taxonomically, *C. capillaris* and *C. tectorum,* have, after repeated attempts, failed to produce hybrids that would grow beyond the cotyledon stage. On the other hand, both of these species cross readily with *C. setosa,* which is classified in a different section of the genus, and produce viable, partially fertile $F_1$ progeny. Such evidence as this has a direct bearing upon the phylogenetic relationships of the species concerned and must be taken into account eventually in the taxonomic treatment of the genus, if the taxonomic treatment is to be thorough and broadly useful. These are illustrative cases from the writer's own field of research; many other experiments with species hybrids have furnished data of comparable value in taxonomy. Most taxonomists may take exception to this on the ground that taxonomy recognizes as critical *only* morphological data. It must be admitted, however, that physiological similarity and dissimilarity has a bearing on phylogeny. Furthermore, when species crosses produce fertile offspring it is possible to study the inheritance of morphological characters in such hybrids.

Genetic analysis, as viewed by some botanists, must always be confined to the investigation of inheritance within single species. Thus in a recent important contribution to the science of taxonomy[1] the following statement is made: "genetic analysis can be of value taxonomically only in studying differentiation within the species itself." Here genetic analysis is considered as necessarily restricted to the experimental breeding of variads which differ only with respect to certain Mendelian factors. But genetics has been defined[2] as the science which seeks to account for the resemblances and the differences which are exhibited among organisms related by descent. One of the most significant developments in the science of genetics has been the extension of Mendelian concepts to include interspecific relationships. It may be helpful to quote here three conclusions[3] which are germane to the subject:

1. As a consequence of modern Mendelian developments, the Mendelian factors may be considered as making up a reaction system, the elements of which exhibit more or less specific relations to one another.

2. Strictly Mendelian results are to be expected only when the contrast is between factor differences within a common Mendelian reaction system as is ordinarily the case in varietal hybrids.

3. When distinct reaction systems are involved, as in species crosses, the phenomena must be viewed in the light of a contrast between systems rather than between specific factor differences, and the results obtained will depend upon the degree of mutual compatibility displayed between the specific elements of the two systems.

The above conclusions were reached as a result of actual genetic analysis of interspecific hybrids in the genus Nicotiana. The evidence thus secured is of significance in considering phylogeny in this genus, and phylogeny is recognized as the very basis of taxonomy in the above-mentioned taxonomic work.[4] The view of genetics and its very limited possibilities for service to taxonomy, as expressed by Hall and Clements, may be fairly representative of the views held by taxonomers generally, and the writer feels that it is time to call attention to the broadening

[1] Hall and Clements, "The Phylogenetic Method in Taxonomy," Carnegie Inst. Wash. Pub. No. 326, 1923, p. 10.

[2] Babcock and Clausen, "Genetics in Relation to Agriculture," N. Y., 1918.

[3] Goodspeed and Clausen, *Amer. Nat.,* 51 (1917), p. 99.

[4] Hall and Clements, *ibid.,* p. 5, *et seq.*

scope of the science of genetics and the greater possibilities which it offers.

One of the important factors contributing to progress in genetics has been the recognition of interdependence between genetics and cytology. It is only recently that the closer coordination of genetics and cytology has resulted in demonstrating that gross morphological variations may be caused by irregularities in chromosome distribution and that such irregularities may be induced in some instances by subjecting the plants to abnormally low temperatures. The hypothesis that new species with new chromosome numbers may originate through natural hybridization of existing species has been greatly strengthened by the results of recent coordinated efforts of the cytologist and the geneticist.

Regarding the allusion made by Hall and Clements[5] to Lotsy's proposed definition of a species, when they designate it as "the definition of the geneticists," so far as the writer is aware no other geneticist has proposed that gametic purity be used as a criterion for distinguishing species, and few other geneticists seem to have taken very seriously Lotsy's proposed revolutionary changes in taxonomic nomenclature. On the contrary, the general practise among geneticists is to use the specific names provided by taxonomists, and these in general are still based upon the concept of what is commonly referred to as a Linnaean species. It seems likely that most geneticists will heartily approve of the stand taken by Hall and Clements[6] in advocating the evolutionary criterion: "The evolutionary view of the species is that it is a definite phylogenetic stock, sprung from and related to similar stocks, and itself undergoing modification into a number of variads. As they have recently come from the same stock these variads are more closely related to each other than they are to those of any other species, and they represent a definite phylogenetic unit, the species, at the same time that they mark its further differentiation." It seems inevitable that the general adoption of this criterion along with the safeguards and helps of field studies and experiments, both ecological and genetical, will ultimately simplify the work of naming plants, and who more than the geneticists and plant breeders should welcome such a result?

Another aid to the recognition of interspecific relationships is found in cytology, particularly the study of the chromosomes. While this science may be looked upon as merely a phase of morphology, it is doubtful whether taxonomists recognize the promise that it holds as a means of aiding the solution of very perplexing problems in phylogeny. Thus when Hall and Clements[7] say that: "The only definite measure of the progress of evolution is the degree of morphological difference, and species necessarily share this morphological basis with other units," it is probable that they are speaking of the external morphological characters of the plant. At any rate, no reference is made by them to the characters of the chromosome group as of possible usefulness in taxonomy. This omission is doubtless justified from the viewpoint of most taxonomers on the ground that cytology is the work of specialists and is too time-consuming to be resorted to by systematists. Yet the methods of examining chromosome number and individuality in plants have been shortened and perfected in recent years, and these methods can be standardized for groups of plants so that cytological assistants could obtain dependable data on extensive series within a comparatively short time by working close to the living material. Furthermore, recent cytological investigations, especially those dealing with the series of chromosome numbers found in many plant genera, have demonstrated a definite relation between major plant groups and their chromosome groups. The chromosome group is, therefore, an indicator of phylogenetic relationship. It may seem beyond the possibility of realization in general taxonomy, but to the writer it appeals as highly desirable that certain groups at least of the higher plants should be chosen for critical investigations, combining all the means available in evolutionary taxonomy including chromosome studies and genetic analysis.

E. B. BABCOCK
UNIVERSITY OF CALIFORNIA

[5] *Loc. cit.*, p. 9.
[6] *Loc. cit.*, p. 11.
[7] *Loc. cit.*, p. 11.

## INVESTIGATIONS CONCERNING IMPORTED BIOLOGICAL STAINS

THE Commission on Standardization of Biological Stains has for some time been carrying on an investigation concerning domestic and imported stains. One article on the subject appeared in this journal which together with other activities of the commission has led to the impression that its members are prejudiced against imported stains. The present paper is prepared to show that any statements that may have been made are based upon sufficient evidence. Good stains and poor stains can be obtained from either domestic or foreign sources, and the principal reason why the commission has laid so much stress on the domestic articles is because of the ease with which we can cooperate with the domestic concerns in assisting them to improve their supplies.

There are certain definite objections to imported stains which apply in general to the whole supply. Some of these same objections may be raised in certain cases to American products, but they apply with particular force in the case of the foreign stains be-

cause of the prestige which such stains have enjoyed in the past. In fact, when the commission first began its work, the chief objective it was urged to attain was to bring American stains up to the standards of those available before the war. It came as somewhat of a shock to realize that no such standards ever existed; but the investigations of the last three years have shown plainly that this is the case.

In the first place, foreign stains have been found to be decidedly impure. The dye content is almost invariably lower than in the case of American stains and does not compare with that of the better stains now available in this country. This low dye content is due in part to inert ingredients that were undoubtedly added to dilute the dye and make it more suitable for textile use. Impurities in the form of foreign dyes are also often present. The presence of such impurities indicates that the stains prepared in Europe both before the war and at the present time were not especially prepared for biological work but were merely textile dyes specially packed and labeled for biological use. Another fact which has been brought out distinctly by recent investigations is that pre-war and post-war importations of the same stain both obtained from the same reliable German concern are not necessarily the same. Apparently, the only constancy that existed was that which was obtained as long as orders were being filled from a single batch. Naturally, the batches on hand at present are different from those from which orders were supplied before the war. This being the case, it is evident that at the present time different lots of stains obtained from foreign sources may vary considerably. As the firms supplying these stains are so distant it would be difficult for them to cooperate with the commission located in this country. As there is no similar body in any other country, there is no scientific control to insure constancy of these foreign stains. Another still more damaging fact which has been discovered is mislabeling. Fortunately, this did not occur very frequently; but it has been observed often enough to shake considerably the reputation of foreign stains in the minds of those who have been carrying on these investigations. A number of specific instances can be given to show the sort of objections to foreign stains that have been found.

Methylen blue is one of the stains in regard to which striking evidence of this kind has been obtained. When the work was started a sample of foreign methylen blue, denoted by number only, was distributed to several zoologists and botanists. In practically every instance this sample was given a very low rating by the investigator, and wherever it has been compared unknowingly with another sample of this same manufacture which the investigator had on hand and which had probably been imported earlier, the sample submitted by the commission was reported to be very much the inferior of the two. Samples of foreign methylen blue have been tested by the commission for their total dye content, and it has been found that many of them contain less than 60 per cent., whereas the American samples run from 80 to 90 per cent., or even higher. One instance has come to our attention which has been very surprising. A certain investigator using methylen blue to stain cartilage found it impossible to obtain American samples giving the same results she had obtained before the war. She finally obtained another sample of foreign methylen blue from the same company as that previously used and found it as poor as the American samples. She was then furnished, thanks to the courtesy of the National Aniline and Chemical Company, with several samples of methylen blue and closely related dyes. One of them proved satisfactory; but this sample was not methylen blue in reality but an entirely different dye known as *new methylen blue*. Evidently the original imported sample she had used must have contained a considerable percentage of this latter dye, and was apparently incorrectly labeled. An interesting point in connection with the labeling of methylen blue concerns that type of stain which used to be denoted as "methylen blue for bacilli." This methylen blue proves to be a zinc salt much like that used for textile purposes but too crude for medicinal use or for delicate staining procedures. In other words, the labeling did not mean that it was especially adapted for staining bacilli but rather that it could not be used for any other purpose. Present investigations show that the purer form is best for practically all purposes. The only purpose for which the zinc salt has been found to be better is not for staining bacteria but for a certain procedure in staining nervous tissue.

In the case of safranin other interesting results have been obtained. It was discovered in 1920 that the pre-war stock was much superior to anything then available in this country. One sample was obtained from abroad in 1914 which was pronounced especially fine by some investigators in this country and too yellow by others. Attempts were made to duplicate this sample in America and the results were very conflicting. It was found that this sample was not a true safranin at all, but a mixture of safranin with some other dye, probably auramin. Other foreign samples were obtained (of pre-war importation in this case), and it was discovered that they were pure safranin, except for inert material, but different from the American samples. Hence the American companies have made an effort to duplicate these, and now true safranin can be obtained in this country of considerably greater concentration than those obtained from Europe. It is still uncertain just how to duplicate

that particular foreign sample which contained the yellow dye and was found especially useful in certain cytological work. Evidently the safranin situation is complicated and can be solved only by close cooperation between dealers and users.

Eosin is another stain in regard to which extreme variation in the imported product has been noticed. A sample of this stain ordered from the usual German sources in 1914 and not delivered in this country until the close of the war was distributed to various investigators. One of these investigators received this eosin and a German methylen blue, both denoted by the number 250. These were the only foreign samples sent him, but he compared them with some samples of his own imported from the same German firm before the war. In regard to them he replied: "The thirteen dyes sent us . . . have been examined and I think that with the exception of two—eosin 250 and methylen blue 250—excellent differential results were obtained after fixation in Zenker's and formol solutions." This same eosin was sent to a bacteriologist who found it so much inferior to any pre-war importation and to the American samples sent him that, when he learned its origin, he said that he did not see how possibly any two American samples could differ from each other to a greater extent than this sample differed from those which he had on hand imported before the war.

A very interesting illustration of the variation in foreign samples of stain is in the case of a rather rare dye known as cresyl violet or cresylecht violet. A paper on this subject recently appeared by Williams.[1] This work was done in cooperation with the commission, and the samples which he used were obtained by the commission for him. His article reports decided differences between two foreign samples of this dye. One of these, which he denotes "original batch," was obtained before the war. The other, which he calls "2nd sample," was obtained after the war from the Will Corporation, but was known to be derived from the same German source. He reports that the two samples each seemed to contain a blue and a red dye in different proportions. The 2nd sample contained so much of the red dye as to be unsatisfactory. He compares them with a National Aniline sample, which proved not to contain this red dye, but to give very satisfactory results with his technic. Spectrometric analysis has proved the general truth of his conclusions. The results were so interesting that they will probably be published separately later in another paper. It is very evident from analysis that his "original batch" was a mixture of two dyes, one of which was actually cresylecht violet. His "second sample" was apparently the wrong one of these two dyes; while the National Aniline sample was apparently pure cresyl violet.

Methyl green has proved a very interesting stain in the course of the present investigation. At the start it seemed a very discouraging stain to work with. A set of several samples was distributed to different zoologists and botanists in 1922. Most of these samples were of American origin, but two of them were imported samples which had been supposed to be the same as pre-war supply. As the reports concerning these samples began to come in it was soon discovered that none of them were to be regarded as satisfactory. The imported samples were better than the domestic samples, but apparently not what they should be. One investigator in particular, without knowing the origin of these samples, reported them "not so good as Grübler's." Such reports showed that although the American methyl green was plainly unsatisfactory at that time the foreign supply could not be relied upon to be constant. The question of preparing a satisfactory methyl green was put squarely up to the American producers with the result that in a comparatively short time the National Aniline and Chemical Company had prepared for us the purest lot of methyl green we had ever examined. Unfortunately, however, this very pure sample did not have the proper staining qualities. It seems there are two important factors in obtaining a satisfactory methyl green. In the first place, it must be *methyl green* instead of methylene green, and in the second place it must *not* be completely free from methyl violet. Methyl violet is a dye so closely related to methyl green that it is almost impossible to free the latter dye from it in the course of manufacture. No pre-war sample was ever free from methyl violet, and to this impurity was due the metachromatic feature of methyl green with which histologists were familiar. Naturally, therefore, the very pure methyl green just mentioned did not have such staining properties. The necessity of this small amount of methyl violet may have been known in Germany before the war, but inasmuch as the ordinary textile dye contains methyl violet the probability is that the presence of this other dye was due to accident rather than intention. At the present it appears that good results may be obtained by intentionally adding a small amount of methyl violet to a pure methyl green. It has also been learned that a reliable methyl green can be now obtained from at least one or two American sources. It should be possible now that the exact facts of the case are known to maintain a supply of this stain of more constant quality than was available from foreign sources before the war.

The conclusions that have been reached as the re-

[1] B. G. R. Williams, "Cresylecht violet, a rare dye," *J. Lab. and Clin. Med.* 8, No. 4, Jan., 1923.

lt of this work are: first, that imported stains avail-
ble before the war were not necessarily constant
ecause they bore the name of the same firm; second,
at there is no evidence that stains imported to-day
re the same as those obtained before the war; and
ird, that if the quality of stains is to be kept under
ientific control, there is much more promise of doing
with the cooperation of domestic concerns than
rough dependence upon the foreign market.

H. J. CONN, *chairman*,
*Commission on Standardization of Biological Stains*

GENEVA, N. Y.

## SCIENTIFIC EVENTS

### PAUL EHRLICH

A BOOK on Paul Ehrlich as a man and a worker as been published to celebrate the seventieth anniersary of his birth on March 14, 1854. *The British Medical Journal* writes:

The book reveals very clearly that Ehrlich was a true enius. He conformed to very few or no rules, and performed his experimental work with the very simplest of pparatus. His laboratory contained a large table covered with endless bottles of reagents, with a Bunsen urner and a few test tubes in one corner; this constituted practically the whole of the apparatus which he sed. Ehrlich had apparently a special kind of intuition hich enabled him to divine from simple experiments the ost profitable lines of further research. It must not be upposed, however, that his methods in any way resembled guesswork. He read enormously and very rapidly, and possessed the power of extracting with great peed from any new book those points which were of real importance to him. It is interesting to note that he considered the acquiring of unnecessary knowledge as actually undesirable. He experimented continuously, and tested and retested every result with the most scrupulous care. "Much work, little publication, and no preliminary communications" was his motto, and he followed it exactly. For example, salvarsan was discovered in 1907, but the discovery was followed by two years of careful animal experimentation before the drug was tried on man, and, as is well known, Ehrlich first gave it out to hospitals for testing clinically under carefully controlled conditions. It is interesting to note that 65,000 samples were distributed gratis by Ehrlich in this way. It was not until 1910 that the clinical results of his work were published, and it was only after these years of trial that the drug was put on the market. The whole procedure may well serve as a model for future workers.

The discovery of salvarsan was a result of immeasurable practical importance, and it is very instructive to learn that Ehrlich insisted that the discovery came as a mere by-product of a research started with purely theoretical aims.

Many characteristic anecdotes regarding Ehrlich are told in this book. One of the most amusing is the account of how he was asked to give the Herter Lectures in America in 1904, and for many months previous to the voyage he refused to see visitors on the ground that he must prepare his lectures; Professor Reid Hunt told him one day that he was certain that the lectures would actually be written on the steamer; later, in America, Professor Reid Hunt happened to visit Ehrlich an hour before the first lecture was to be given; Ehrlich turned to him and said, "You did me a great wrong when you said that I should write my lectures on the steamer; I did not do so, I have only started to write them now."

### THE AMERICAN SCHOOL OF PREHISTORIC RESEARCH

THE American School of Prehistoric Research in Europe, which is affiliated with the Archaeological Institute of America and the American Anthropological Association will begin its fourth year on July 1. Qualified students of both sexes are admitted from both North and South America; enrollment may be for the summer term or for a longer period. There is no tuition fee, but contributions to the funds of the school by those who can well afford it are welcome.

The work of the summer term consists of excavations sufficient to give the students first-hand knowledge of methods and culture sequence; the study of museum collections; lectures by the director of the school, also (at various places) by distinguished European anthropologists; and excursions to the most important Paleolithic, Neolithic, Bronze and Iron-age sites.

The tentative program is as follows:

Southern England—London; Ipswich and Grime's Graves; Avebury and Stonehenge.
France—Somme valley; Paris; Saint-Germain; Brittany.
Belgium—Liège (French Assoc. for the Adv. of Science); Brussels.
Holland—Amsterdam; Haarlem (*Pithecanthropus*); The Hague (Intern. Congr. of Americanists, 1st part).
Denmark—Copenhagen.
Sweden—Göteborg (Intern. Congr. of Americanists, 2d part); Stockholm (if time permits).
Germany—Berlin; Halle; Leipzig; Jena; Weimar; Stuttgart; Tübingen; Constance.
Switzerland—Schaffhausen; Zürich; Berne; Bienne; Neuchâtel; Geneva.
France—Lyons; Roanne; Solutré; Aurillac; Brive; Périgueux; Les Eyzies (and the stations in the Vézère valley); Charente (Angoulême and La Quina).

After consultation with the director, students may choose for the winter term the center of learning which may offer them the best facilities for the working out of the problems in which they are interested.

Applications for admission to the school should be sent to the director, Dr. George Grant MacCurdy,

Peabody Museum, Yale University, New Haven, Conn. Foreign address: Care director, American School of Prehistoric Research in Europe, American University Union, 50 Russell Square, London, W. C. 1 (from July 1 to 15). American University Union, 173 Boulevard Saint-Germain, Paris, after July 15.

## THE COLD SPRING HARBOR BIOLOGICAL LABORATORY

THE Biological Laboratory at Cold Spring Harbor, Long Island, formerly a department of the Brooklyn Institute of Arts and Sciences, has been transferred definitely to the Long Island Biological Association. The following officers were elected at a recent meeting of the board of directors of the association: *President,* Colonel Timothy S. Williams; *Vice-president,* Marshall Field; *Secretary,* Dr. Charles B. Davenport; *Treasurer,* Arthur W. Page, and *Laboratory Director,* Reginald G. Harris. Over one hundred persons were voted into membership of the association.

Members of the board of directors, other than the officers already mentioned, are: Henry W. De Forest, Dr. George Draper, Professor H. D. Fish, Dr. G. Clyde Fisher, Henry Hicks, Dr. Walter B. James, Walter Jennings, Professor D. S. Johnson, Mrs. Otto H. Kahn, Dr. Frank Overton, Professor H. M. Parshley, Mrs. C. C. Rumsey, Mortimer Schiff, John H. J. Stewart, Professor W. W. Swingle, W. K. Vanderbilt and Professor H. E. Walter.

Alumni of the laboratory and others are eligible to membership in the association upon the approval of the board of directors and the payment of an annual subscription.

The announcement of the thirty-fifth year of the laboratory has appeared, showing, in general, a continuance of the previous policy, with increased provision for investigation. In this connection Professor W. W. Swingle, of Yale University, is an addition to the staff as investigator and lecturer in endocrinology. Other members of the staff of investigation are: Professor Edgar N. Transeau, of Ohio State University, investigator in botany; Professor J. Walter Wilson, of Brown University, in charge of experimental zoology, and Reginald G. Harris, laboratory director.

Courses of instruction are given in field zoology by Professors H. E. Walter, Brown University, assistant director; Howard M. Parshley, Smith College; J. Walter Wilson, Brown University; William Smith, University of Pittsburgh; George F. Sykes, Tufts Medical College, and Mr. O. M. Helff, Yale University; in comparative anatomy, by Professor Henry Sherring Pratt, Haverford College, in the endocrine system, by Professor W. W. Swingle, Yale University; in systematic and field botany, by Professor Norman MacD. Grier, Dartmouth College, and Miss Gail Holliday; in plant ecology, by Professor Edgar N. Transeau, Ohio State University.

During the period of instruction lectures will be given to the laboratory by Drs. G. Clyde Fisher, Oscar Riddle, R. C. Murphy, A. M. Banta, H. H. Laughlin, A. F. Blakeslee, W. W. Swingle and C. B. Davenport.

The laboratory is open for investigation throughout the year; the director and collector being in continued residence. Accommodations are guaranteed for a large number of investigators from June 15 to September 15. Courses of instruction open July 2 and continue through August 13. The laboratory maintains a service of supply.

R. G. HARRIS

## THE FOREST RESEARCH COUNCIL

SECRETARY of Agriculture Henry C. Wallace has announced through the Northeastern Forest Experiment Station at the Massachusetts Agricultural College, the members of the Forest Research Council. The council was organized at Amherst on April 3, the first of its kind in the country. It brought together spokesmen of many of the wood-using and particularly the timber-owning industries of the forestry schools and the agricultural colleges. The membership includes:

W. R. Brown, president, New Hampshire Timberland Owners' Association, chairman, New Hampshire Forestry Commission, Berlin, N. H.

P. S. Collier, secretary, Northeastern Retail Lumber Dealers' Association, Rochester, N. Y.

S. R. Dana, director, Northeastern Forest Experiment Station, Amherst.

R. T. Fisher, director, Harvard Forest, Petersham.

J. H. Foster, State Forester, Concord, N. H.

R. S. Hosmer, department of forestry, New York State College of Agriculture, Ithaca, N. Y.

C. H. Keith, president, New England Box Company, Greenfield.

R. S. Kellogg, secretary, News Print Service Bureau, New York.

J. C. Kendall, director, New Hampshire Agricultural Experiment Station and Extension Service, Durham, N. H.

Franklin Moon, dean, New York State College of Forestry, Syracuse, N. Y.

H. G. Philbrook, president, Vermont Timberland Owners' Association, Boston.

G. W. Sisson, Jr., president, Racquette River Paper Company, Potsdam, N. Y.

W. L. Slate, director, Connecticut Agricultural Experiment Station, New Haven, Conn.

J. W. Toumey, Yale School of Forestry, New Haven, Conn.

F. A. Waugh, division of horticulture, Massachusetts Agricultural College, Amherst.

Earle H. Clapp, of Washington, assistant forester in charge of the research branch of the United States Forest Service, will represent the Department of Agriculture.

Secretary Wallace specifies the function of the council in his letter of appointment as follows:

I have been asked to take the leadership in organizing a Forest Research Council to act in an advisory capacity both to the Northeastern Forest Experiment Station and to other forest research agencies throughout the Northeast (New England and New York). The council will not conduct any research, but will aim rather to stimulate and guide research. Its recommendations should be effective in securing the adoption of a more comprehensive, better coordinated, and more effective program of forest research. It should be influential in calling attention to the results of investigations and in getting these results put into actual practice.

## THE PHYSICAL SOCIETY OF LONDON

THE fiftieth anniversary of the foundation of the Physical Society in London was celebrated on March 22, at a banquet with about 400 members and guests in attendance. These included representatives of numerous kindred societies and institutions, together with distinguished scientific men from America, France, Belgium and other foreign countries. The international aspect of physical research and the progress and achievements attained during the last half-century were emphasized by several of the speakers. The president, Mr. F. E. Smith, was in the chair.

The speakers were Mr. Ramsay MacDonald, prime minister, the Duke of York, Professor Sir Richard Glazebrook, Professor Charles Fabry, president of the French Physical Society, Sir Oliver Lodge, Professor Sir Joseph Thomson, Sir Joseph Cook, high commissioner of the Australian commonwealth, Mr. J. H. Jeans and Professor Sir Ernest Rutherford.

In the course of his address Mr. MacDonald, as reported in the London *Times*, said:

One reason why he had been asked to come there and propose the toast was a certain family connection—one of which he was very proud. The first president of the society—and the first among a group of founders of the society—was the late Dr. Gladstone, his father-in-law. The mentality of the scientific man had in his (the prime minister's) own lifetime gone through a certain evolution, but in Dr. Gladstone, as in his great and distinguished colleagues, tnere was something that never moved away from that magnificent childish curiosity that approached research as a religious devotee approached worship. Whether the pioneer into the unknown was pursuing the path of the theologian, and exploring some of the secrets that eternity vouchsafed to reveal to us, or whether he was wandering over the face of the earth crossing unknown deserts, or penetrating hitherto unpenetrated forests, or whether, as those present that evening were doing, he was pioneering into the curious composition and relations of matter—whatever rank or group of pioneers they belonged to, they were all most successful when they approached their problems with a heart full of awe as well as full of expectation. The past presidents of the society were men of intellectual distinction and of moral honesty unsurpassed by any group in any other walk of life during the 50 years that the society had been in existence.

## DINNER IN HONOR OF MR. GARVAN

IN recognition of the distinguished services of the Honorable Francis P. Garvan to the cause of chemistry in America, a dinner will be given in his honor at the Waldorf-Astoria, New York City, Saturday evening, April 26.

Invitations to the dinner are being issued in the names of the presidents of the American Chemical Society, American Electrochemical Society, American Institute of Chemical Engineers. American Association of Textile Chemists and Colorists, Manufacturing Chemists Association, Salesmen's Association of the Chemical Industry and Synthetic Organic Chemical Manufacturers' Association.

At a recent meeting of the representatives of these organizations, Charles H. Herty was appointed chairman of the committee on arrangements, and A. V. H. Mory will act as treasurer.

This dinner will be the closing feature of a week of unusual chemical activities. The American Chemical Society will hold its annual spring meeting during the week of April 21–25, in Washington, and the American Electrochemical Society will hold its spring meeting, April 24–26, in Philadelphia. Both societies have been invited by General Amos A. Fries, head of the Chemical Warfare Service, to visit Edgewood Arsenal on Saturday, April 26, to inspect the grounds and buildings.

It is expected that this gathering will bring together not only representatives of the various branches of chemistry, both from the universities and the industries, but will also be attended by large groups from other professions and organizations with which Mr. Garvan has been in close touch, including representatives of the legal and medical professions.

## SCIENTIFIC NOTES AND NEWS

THE council of the British Association has resolved to nominate Dr. Horace Lamb, F.R.S., formerly professor of mathematics in the University of Manchester, as president of the association for the Southampton meeting in 1925.

GILBERT NEWTON LEWIS, professor of physical chemistry in the University of California, has been elected by the jury of award to receive the Willard Gibbs Medal of the Chicago Section of the American Chemical Society. The presentation of the medal and the address by Dr. Lewis will take place this month.

A PORTRAIT of Dr. Charles K. Mills, emeritus professor of neurology in the Medical School of the University of Pennsylvania, has been presented to that school by Dr. F. X. Dercum, professor of neurology in the Jefferson Medical College and a graduate of the University Medical School. Dr. Mills was graduated from the University of Pennsylvania in 1869, and began teaching there in 1874, remaining fifty years.

DR. NOGUCHI, of the Rockefeller Institute, has been doing research work on the plague at Bahia, and the medical faculty has renamed the laboratory in his honor, "Laboratorio Dr. Noguchi." A plate with the inscription has been unveiled by Professor A. Vianna, founder of the local branch of the Oswaldo Cruz Institute.

THE Italian air force gave a banquet in honor of Roald Amundsen, the explorer, who arrived in Rome on April 4 to confer on technical matters connected with the proposed attempt to fly to the North Pole. Lieutenant Ralph E. Davison, of the American Naval Air Service, is in Pisa, where he is organizing the mechanical part of the expedition.

DR. FREDERICK G. BANTING, Toronto, was tendered a banquet at the Hotel Biltmore, New York City, on April 9, by the Sulgrave Institute. Among the guests were Drs. Livingston Farrand, president of Cornell University, New York; William Darrach, dean of the College of Physicians and Surgeons of Columbia University; John G. Hibben, president of Princeton University; Samuel A. Brown, dean of New York University and Bellevue Hospital Medical College; Frank J. Monaghan, city commissioner of health, and Linsly R. Williams, of the New York Academy of Medicine.

GEORGE M. BERINGER, of Camden, N. J., will receive the fifth impression of the Remington Medal at a dinner to be given in his honor, Monday evening, April 14, at the Robert Treat Hotel, Newark, N. J. This medal is awarded each year by the New York Branch of the American Pharmaceutical Association for conspicuous service to the art and science of pharmacy. The jury of award consists of the ex-presidents of the American Pharmaceutical Association.

DR. THOMAS GILMER, dean emeritus of Northwestern University Dental School, has been named by the faculty as the recipient of the William Janke Medal for exceptional scientific contributions.

SIR ANTHONY BOWLBY, Bt., K.C.B., F.R.C.S., has been elected chairman of the Radium Institute, London, in succession to the late Sir Malcolm Morris.

PROFESSOR S. J. HICKSON is to retire next September from the chair of zoology in the University of Manchester, on reaching the age of sixty-five. He succeeded the late Professor Milnes Marshall, who lost his life on Scafell.

THE following officers of the Physical Society of London were elected at the annual meeting on February 8: *President,* Mr. F. E. Smith; *Vice-presidents,* Dr. E. H. Rayner, Dr. J. H. Vincent, Mr. T. Smith and Mr. C. R. Darling; *Secretaries,* Dr. D. Owen, Professor A. O. Rankine; *Foreign Secretary,* Sir Arthur Schuster; *Treasurer,* Mr. W. R. Cooper; *Librarian,* Mr. J. H. Brinkworth.

THE committee on scientific research of the American Medical Association has made an award of $250 to Dr. Victor C. Jacobson, professor of pathology in Union University (Albany Medical College), to be used in the experimental study of implantation adenomas of endometrial (Müllerian) type and their relation to epithelial tumors of the ovary. The committee has awarded grants of $200 each to Dr. Charles E. Simon, of the School of Hygiene and Public Health of the Johns Hopkins University, for further investigations into the mode of dissemination of measles and the viability of the corresponding virus, and to Dr. J. F. McClendon, of the University of Minnesota, for the purpose of investigating the electric conductivity of living tissues.

A. M. HENRY, formerly assistant state chemist of Florida, has been made acting chief of the U. S. Food and Drug Inspection Station at Philadelphia.

DR. E. K. CARVER, of the physical chemistry division of the University of Illinois, is now with the physical chemistry department of the Eastman Kodak Company, of Rochester, N. Y. Dr. Carver left the University of Illinois on February 20.

HENRY R. ADAMS, of the Michigan Agricultural College, and Charles W. Simmons, of Pennsylvania State College, have joined the staff of the Agricultural Experiment Station of Purdue University.

IT is reported in the daily press that Dr. Fridtjof Nansen has consented to undertake with the Russian airman Rossinsky a flight to the North Pole. According to the latter, while approving the plan, Dr. Nansen has cabled that he will shortly go to Moscow to discuss the full details of the expedition. A specially designed airplane would be used.

DR. GERRIT S. MILLER, JR., curator of the division of mammals of the National Museum, left Washington last month for a visit to some of the islands of the Lesser Antilles. Dr. Miller expects to make collections of the flora and fauna of the islands.

HENRY MALLEIS, of the Biological Survey, has returned to the Petén District of Guatemala, where he will endeavor to obtain live specimens of the ocel-

lated turkey for introduction on one of the islands off the coast of Georgia.

DR. CARL LARUE has returned from a trip up the Amazon, undertaken for the United States Department of Agriculture. He is on leave of absence from the University of Michigan for a year, during which time he is placing his experience, acquired in the rubber plantations of Sumatra, at the service of the government in its study of Hevea. Accompanied by Dr. James R. Weir, pathologist, United States Department of Agriculture, Dr. LaRue went up the Amazon and Madeira rivers to the Province of Matto-Grosso and the lowlands of Bolivia. Returning down the Madeira and to Para, Dr. Weir proceeded to Pernambuco, Rio de Janeiro, Montevideo and Buenos Aires while Dr. LaRue returned up the Amazon to Bolivia, where he collected cuttings and other propagating material for planting at the testing garden in the Canal Zone. After establishing this material Dr. LaRue returned to Washington where he will prepare his report. Dr. Weir returned some time ago with collections of pathological and mycological material which will be deposited in the pathological collections of the United States Department of Agriculture.

DR. HUBERT LYMAN CLARK, of the Museum of Comparative Zoology, who has been granted leave of absence, sailed for England on April 12 for the purpose of studying at the British Museum (South Kensington). He will work on various groups of sea-urchins, holothurians and brittle-stars. He expects to return to Cambridge in July.

DR. FREDERICK BEDELL, professor of physics at Cornell University, recently completed a twelve thousand mile motor camping trip with his family around the rim of the United States. An account of the trip written by Mrs. Bedell is about to be published in book form by Brentano's under the title "Modern Gypsies."

DR. W. D. HARKINS, of the University of Chicago, made a lecture tour in March, visiting the University of Iowa, Cornell College, The Iowa Agricultural College at Ames, the University of Nebraska and the University of Denver.

DR. JOHN J. ABEL, professor of pharmacology, Johns Hopkins University Medical School, will deliver the sixth Harvey Society Lecture at the New York Academy of Medicine, on Saturday evening, April 12, 1924. His subject will be "Physiological, chemical and clinical studies on pituitary principles." Dr. Herbert M. Evans, professor of anatomy of the University of California, will deliver the seventh lecture on Saturday evening, April 26. His subject will be "The function of anterior hypophysis."

DR. HENRY BALDWIN WARD, of the University of Illinois, lectured at Albion College on the evening of March 25. The title of the lecture was "On the trail of the Alaska salmon." After the lecture the Biological Club held an informal reception for Dr. Ward in the new biological laboratories, now practically completed. There are now available for the biological sciences a small but well-built greenhouse, seven laboratories equipped with Sheldon furniture, offices and storerooms. About $14,000 have been spent in re-equipping the department of biology since the disastrous fire of December, 1922.

ARTHUR D. HOLMES, director of the research laboratories of the E. L. Patch Company, Boston, Mass., lectured on "The place of cod liver oil in pharmacy" before the students of the Philadelphia College of Pharmacy and Science and before the Philadelphia Association of Retail Druggists on March 6.

SIR ERNEST RUTHERFORD delivered a lecture on April 4 at the Royal Institution on "The nucleus of the atom."

THE Edward G. Janeway lectures will be delivered at Mount Sinai Hospital on April 22 and 24, by Professor Ludwig Aschoff, of the University of Freiburg. His subjects will be "The reticulo-endothelial system" and "The pathogenesis of tuberculosis of the lungs."

M. EMILE PICARD, permanent secretary of the Paris Academy of Sciences, will represent the academy at the ceremonies in commemoration of the centenary of Lord Kelvin in London on July 10 and 11.

DR. HENRY HUN, from 1885 to 1915 professor of nervous diseases at the Albany Medical College, died on March 14, aged seventy years.

DR. ARTHUR E. HOULEHAN, assistant director of the Jackson Laboratory of the du Pont Dye Works, Wilmington, Del., died on March 10, at the age of thirty-nine years.

ROBERT P. NEVILLE, associate chemist in the Bureau of Standards, died on February 3, aged twenty-nine years.

DR. WILLIAM JACK, professor of mathematics at Glasgow University from 1879 to 1909, died in Glasgow on March 20, aged seventy years.

DR. GRUBENMANN, professor of geology and mineralogy at the University of Zurich and at the Federal Polytechnic Institute, has died at the age of seventy-four years.

THE twelfth congress of the Italian Society for the Advancement of Science will be held at Naples from April 29 to May 3, immediately before the celebration of the seventh centenary of the university on May 9.

THE fourth French Congress of Industrial Chem-

istry opens at Bordeaux on June 14, under the presidency of M. Philippart, Mayor of Bordeaux.

THE commissioner of Plants and Structures of New York City, Grover Whalen, has placed a municipal ferry boat at the disposal of engineering students to enable them to visit power plants in the vicinity of New York Harbor in connection with the ninth annual joint convention of the branches of the American Society of Mechanical Engineers with the Metropolitan Local Section on April 30. The evening session will be a symposium on Combustion Control.

As the first part of a program intended to awaken interest in astronomy in Philadelphia, Pa., the Camden Astronomical Society has recently completed a course of popular lectures, given in conjunction with the Division of School Extension of the Philadelphia Board of Education. The lectures were delivered in the auditoriums of several of the city high schools, the speakers and subjects being as follows: February 13: "The solar eclipse of September 10, 1923," Professor John A. Miller, director of the Sproul Observatory of Swarthmore College. February 26: "Some interesting objects in the sky," Dr. John H. Pitman, of the Sproul Observatory of Swarthmore College. March 12: "A journey to our stellar neighbors," Mr. A. Clyde Schock, of the mathematics department of the Central High School. March 19: "The big telescopes and what they do," Mr. James Stockley, Jr., of the science department of the Central High School. All the lectures were illustrated with lantern slides, and, in the case of the first, by motion pictures of the eclipse made by the Sproul Observatory expedition to Mexico. The attendance averaged about 600 people, and, as the schools chosen were in widely different parts of the city, an entirely new audience was found in each. In this way, a large group was reached.

## UNIVERSITY AND EDUCATIONAL NOTES

MRS. ADDIE V. WILBUR has given to Boston University the sum of $126,000 to be used for building purposes. The university has also received an anonymous gift of $100,000 to endow the Borden P. Bowne chair of philosophy.

THE University of Arizona at Tucson is constructing the first unit of a new library building at a cost of about $400,000. It is hoped that at least part of the building will be ready for use by the time the university opens in the fall.

THE trustees of the Francis Estate have conveyed to the president and fellows of Harvard College the lot at the corner of Longwood avenue and Avenue Louis Pasteur, opposite the medical school, to be the site of the new medical dormitory. The committee in charge reports that up to March 26 the total subscriptions received were $158,359.85, which included $89,027.85 subscriptions from physicians averaging $77.34 each. It is estimated that the building will cost in the vicinity of $900,000. It will house 257 students and will contain the assembly hall, which will be also the dining room, living rooms, kitchens and squash courts.

DR. C. D. HURD, of the University of Illinois, has been appointed assistant professor of organic chemistry at Northwestern University.

RALPH G. VANNAME, assistant professor of chemistry at Yale University, has been promoted to the rank of associate professor.

O. F. T. ROBERTS has been appointed Cruickshank lecturer in astronomy and meteorology at the University of Aberdeen.

PROFESSOR OSWALD BUMKE, of Leipzig, has been nominated successor to Professor Emil Kraepelin in the chair of psychiatry and neurology at Munich.

## DISCUSSION AND CORRESPONDENCE

### PALEOBOTANY AT THE NEW YORK STATE MUSEUM

IN 1904 I contributed a short note to the pages of SCIENCE,[1] entitled "A notable paleobotanical discovery," calling attention to the demonstration by Scott and Oliver that the Carboniferous cycad-like stems, the sphenopteroid fern-like fronds and the large complex seeds known as Lagenostoma all belong to a single plant, now known as Lyginopteris.

This was the real beginning of a series of discoveries by Scott, Oliver, Kidston, White, Arber and others, that placed the phylum of the seed ferns or Pteridospermophyta on a secure foundation.

The presence of seed ferns from strata older than the Carboniferous has been confidently predicted, not only from their diversity in Carboniferous times, but because of the presence in the Devonian of the petioles known as Kalymma, which are rather definitely related to the pteridosperms.

We now have a paper by Goldring[2] describing the Devonian forest at Gilboa, New York, which might readily be termed a notable paleobotanical discovery had that title not been already used; a paper which in method of research and presentation is in most striking contrast to the recently widely heralded discovery of a monocotyledon from the coal measures of

[1] SCIENCE, N. S., Vol. 20, pp. 56, 86, 1904.

[2] Goldring, W., "The upper Devonian forest of seed ferns in eastern New York," *N. Y. State Mus. Bull.*, No. 251, pp. 50–92, tf. 1–7, pl. 1–11, March, 1924.

Illinois, which last was about as illy advised and unconvincing a performance as the history of science can show.

The Gilboa trunks representing an old forest at several levels have been imperfectly known for over 50 years, and were quite incorrectly described as Psaronius by Sir William Dawson. Recent collections by the New York State Museum have brought together in that institution a remarkable collection of stumps, roots, fronds, seeds and microsporangial organs. It is true that these have not been found in organic connection, but the circumstantial evidence is rather convincingly in favor of such a relationship and of the restoration which forms Plate 1 of Miss Goldring's contribution.

These Devonian seed ferns are referred to a new genus known as Eospermatopteris and the various classes of remains are described and illustrated in great detail. These trees had slender tapering trunks, that give evidence of secondary thickening. One of the largest is three and one half feet in diameter at the greatly expanded butt. The standing trunks are all broken off some three feet or less above the base, but broken portions up to twelve feet in length have been found, and the actual height is estimated as at least 30 to 40 feet. Bases of the fronds are found attached to the trunk in one specimen. The roots are unattached but common in the underclay in which the stumps are rooted. The fronds are tripinnate, six feet or more in length and with finely divided laminae of the Sphenopteridium type.

The seeds were borne in pairs at the summits of modified pinnules, distally on the fronds. They are somewhat ovate in form and completely invested by cupules. The microsporangia are likewise borne at the tips of forking branchlets. They are compared with those of Crossotheca, and are funnel or saucer-shaped with scars supposed to mark the places of attachment of the sporangia.

It is no secret that the state museum is engaged in the formidable undertaking of a life-sized group restoration of the Gilboa forest, thus blazing the way for paleobotanical groups, which method of representation has been so successfully exploited by them in connection with invertebrate fossils, and by most large museums in connection with fossil mammals as well as with recent mammals and birds.

There can be no doubt of the very great value of such a group both to scientists and laymen, and paleobotanists are to be congratulated upon the wisdom and energy with which the director of the New York State Museum is supporting the study of the remarkable Devonian flora of that state, a field hitherto scantily tilled in this country.

EDWARD W. BERRY

THE JOHNS HOPKINS UNIVERSITY

## THE INFECTION OF TOBACCO PLANT BEDS BY SPITTING

RECENT observations by the writer have brought to light an important means of infection of tobacco plant beds with bacterial leaf-spot diseases, which has been overlooked heretofore. The facts should be of general interest because of the peculiar relationship existing between man, a plant and disease-producing organisms, and of special interest to the tobacco pathologist because the observations suggest the possibility of a very simple means of control of two very serious tobacco diseases. The diseases in question are the angular leaf-spot (*Bacterium angulatum* Fromme), also called rust in the Burley section of Kentucky and black fire in the dark tobacco sections of this and neighboring states, and wildfire (*Bacterium tabacum* Wolf and Moss).

Two methods of control have been suggested for these two very similar diseases. One of these—seed treatment, with other sanitary precautions—has aimed to prevent the introduction of the bacteria into the bed, and the other—spraying or dusting—has aimed to prevent the spread of the bacteria after they have been introduced. The latter method is objectionable as it is expensive and adds an entirely new practice to the tobacco industry, and, further, it aims to prevent diseases the sources of which are not fully understood. The former recommendation has largely failed, in Kentucky at least, where it has been widely tested, due to some previously unknown source of infection.

The past spring, in trying to explain the presence of both wildfire and angular leaf spot in a bed where all known precautions had been taken to prevent these diseases from entering, the writer observed that the tenant who tended the bed was incessantly chewing tobacco and spitting. He admitted that he often spit into the bed while weeding it and stated that he chewed natural leaf from the previous year's crop. It had been positively proved by others that the causal organisms of both these diseases live over winter in the cured leaves. Following up this lead, records were obtained on about 35 beds before weeding and a much larger number after weeding. All the beds examined before weeding were free from bacterial leaf-spots. The same beds, with four exceptions, were infected with angular leaf spot after weeding. The four beds which were free from infection were tended by men who did not use tobacco; whereas in every case where infection occurred, tobacco of the previous year's crop, often supplemented by commercial tobacco, was chewed by someone who had worked in the beds or had loitered around them at some time. Angular leaf-spot was present the past year in over 90 per cent. of the

tobacco fields in Kentucky, but an occasional field was found which was entirely free. In each of the latter cases investigated the grower did not use chewing tobacco. The writer has a considerable amount of other evidence indicating the importance of chewing tobacco as a source of plant-bed infection.

Although nearly all the evidence gathered so far points to chewing tobacco made from the natural leaf of the previous crop as the chief source of plant-bed infection, it is possible that commercial tobacco, either raw or manufactured, may have played an important part in the rapid world distribution of the wildfire organism.[1]

By properly protecting the seed heads from infection by the use of paper bags, pouring the seed from clipped seed pods, and proper sanitary precautions with respect to the seed beds, it should be possible to control these two destructive tobacco diseases without the use of either seed treatment or dusting and spraying.

W. D. Valleau
University of Kentucky

## MERCURIC CHLORIDE AS A PREVENTIVE OF CERTAIN DAMPING-OFF FUNGI

In the course of a series of experiments for the control of the root maggot in cabbage seed-beds, a clear-cut relation has appeared between certain of the treatments applied for the maggot and the amount of damage done by soil-infesting fungi, as the Rhizoctonia and Plasmodiophora.

For the last three years it has been repeatedly observed that the plants in different plats showed a marked difference in susceptibility to such diseases. Some of the treatments used, while thoroughly effective in maggot control, actually increased the liability to loss from such fungous troubles, while others, notably mercuric chloride, very largely prevented the diseases.

In these experiments the mercuric chloride was commonly used at the rate of 1–1200, although dilutions considerably greater than this appear to have distinct value. A series of from one to six applications was ordinarily made in each plat, at intervals of a week or ten days, beginning shortly after the plants appeared through the ground.

Careful examination of such plats showed that while one application gave but little protection, two, and especially three, gave excellent control for Rhizoctonia. Under the existing conditions nothing appeared to be gained by a greater number of applications.

This treatment is being tried out on a number of soil-infesting fungi and on different crops, and it seems probable that this method may have a much wider application in controlling diseases of this character on other crops than cabbage.

Hugh Glasgow,
W. O. Gloyer
New York Agricultural Experiment Station,
Geneva, New York

[1] Since writing the above, the writer has been informed by Mr. Temple Smith, of Victoria, Australia, that these two diseases are unknown there and that he has rarely if ever seen an Australian tobacco grower chew tobacco. He stated that every three or four years they obtain a new supply of seed from the United States.

## SCIENTIFIC BOOKS

*An Elementary Treatise on Frequency Curves and their Application in the Analysis of Death Curves and Life Tables.* By Arne Fisher. Translated from the Danish by E. A. Vigfusson. With an introduction by Raymond Pearl. New York, The Macmillan Co., 1922. XV + 240 pp.

Not many readers of Science will read Fisher's book; it is not the kind that is read. It is original and arithmetical—two items against it, particularly when taken in conjunction. It has been received both with enthusiasm and with contempt by specialists in its line—two items in its favor. The book undertakes to show that one can construct a life table from a record of deaths at attained ages without knowing the numbers alive. In a variety of worked illustrations of the method, in some of which the author could not have known the numbers living, he has set up a life table that has been shown to be good in so far as the numbers of the living could be ascertained and a computation made in the ordinary way. The working hypothesis is biological in the sense that it is assumed that the different causes of death or groups of causes take their toll of life in a regular or lawful way—that we have diseases and deaths of early, middle and late life. This is not any foolish hypothesis; everybody knows it. But it remained for Fisher to show that what all know he can use in a strictly quantitative way to set up a life table. The technical method of analysis is the Charlier system of frequency curves for handling statistical material, except that Fisher determines the coefficients of the expansions by the method of least squares instead of by the method of moments.

The best review of the book is Pearl's *Introduction* in which the relation of Fisher's work to biological and actuarial science and their intimate relation to each other is exhibited leading to the conclusion that this is *fundamentally* the most significant advance in actuarial theory since Halley. True, doubtless, but how terrifying. What with Einstein making the first fundamental advances in mechanics since Newton, and Mrs. Eddy the greatest religious leader and organizer

since St. Paul if not since Moses, and George Owen the greatest all around athlete since young Hercules went to school, and Henry Ford introducing the only fundamental change in personal transportation since we first got up on our hind legs, not to mention Bernard Shaw, who mentions himself well up in front of Shakespeare, we may well fear that our headline ridden and billboard laden civilization is getting into that unstable condition of tension found in the frog who would be as big as an ox and that like him we may suddenly explode; however, we should not overlook the stabilizing and cohering tendency of the great fundamental advance in social responsibility from Cain to Wayne B. Wheeler, *μηδὲν ἄγαν*.

There are two trivial things about this book that I might criticize adversely. First, there are far too many centenarians in some of the tables; it would have been better to curtail the tabulation with an (obvious) explanation of why the method broke down at advanced ages. Second, in the introductory remarks we are told that Archimedes had laid the essential foundation for an integral calculus about 500 B. C.; even with modern mechanistic theories of heredity, it is doubtful if one can really establish a priority dating from the fifth (ca.) ancestral generation. It should be mentioned that the first 104 pages of the book are practically a verbatim reprint of those parts (pp. 188–277) of the author's "Mathematical Theory of Probabilities" which deal with frequency functions.

EDWIN B. WILSON
HARVARD SCHOOL OF PUBLIC HEALTH

*A Check List of North American Amphibians and Reptiles.* By LEONHARD STEJNEGER and THOMAS BARBOUR. Second Edition. Cambridge, Massachusetts, Harvard University Press, 1923. 171 pages.

SINCE the first edition of the check list, in 1917, there has been considerable activity in the study of North American reptiles and amphibians. Just how much of the interest in this subject has been due to the first edition can not, of course, be determined, but it scarcely needs to be said that the first list has at least been of great assistance to students. The second edition should be as valuable as the first, since it not only brings together the results that have been obtained in the intervening period but also corrects most of the mistakes and many of the imperfections which marred the first volume.

The progress in North American herpetology since 1917 is shown in part by the larger size of the second edition. One hundred forms have been added to the list, of which 71 have been described since the first list, 26 were previously described, two are introduced forms, and one—a Mexican species—has had its range extended into North America. Three species or subspecies have been relegated to the synonymy and eleven have been dropped. The total number of species and subspecies recognized in 1923 is thus larger by 86 than the number occurring in the 1917 list. It may be added that the check list recognizes 591 forms in the region covered: "North America, north of the Rio Grande, and in Lower California, Mexico."

The increase in the number of recognized forms during the past five years is evidently, at least to the herpetologist, not due in any large part to an epidemic of splitting. Students of North American reptiles and amphibians continue—and for this let us return thanks—to be sane (conservative) in their analytical work, although signs are not wanting that investigators in this field are not uninfluenced by the activities of their colleagues in ornithology. The additions to the 1917 check list recorded in the second edition are mostly the result of monographic revisions of hitherto neglected groups and the study of collections from regions only recently explored.

As was to be expected from the reputation of the authors, the second edition has been carefully revised. Several slips in the alphabetical arrangement of species in the first volume have been corrected; a serious attempt has been made to remedy the imperfections in the descriptions of ranges in the earlier edition; and a table of contents and index have been added. The book is carefully edited, and the excellent typography and arrangement of the first edition have been used. Particularly to be commended is the care which has been exercised in the spelling and accenting of Spanish place names.

While it is not to be expected that no fault is to be found with the revised edition, students will be loath to criticize it. The preparation of such a list is a time-consuming and tedious work, and this one will be so useful and is on the whole so well prepared that to hint a fault is to appear ungrateful for the disinterested efforts of the authors. The very excellence of the work, however, makes it imperative that its imperfections be recognized, for, even though no other editions are issued—and this would be regrettable—it will serve as a foundation and model for future lists.

There is still room for improvement in the matter of recording distribution. Reference is not made to such obvious errors as the extension of the range of *Lampropeltis getulus getulus* to include southern New England, which will not confuse herpetologists, but to the inadequacy of many of the descriptions. The authors are here confronted with difficulties. They must secure brevity; and the delineation of ranges often means the looking up of literature and the verifying of references in proportion to the thoroughness desired. The reviewer notes several ranges, however, which could be recorded in as few words, and more

perfectly, by taking the descriptions from recent monographs.

No attempt is made to give synonyms, the references being mostly to original descriptions and to the first use of the name in the approved form, as in the first edition. If this plan were followed consistently, all the 17 names dropped from the first edition would disappear. As it is, six are given as synonyms and eleven are not referred to. The inference is that names which have disappeared have been placed in synonymy by the last reviser, but in some cases names have been omitted on the basis of revisions which are still in manuscript form. This is certain to cause some confusion. Either the names omitted should have been only those relegated to synonymy in published papers, or, and we believe preferably, all names placed in synonymy since the 1917 list should appear as synonyms in the second edition.

The authors of a work of this kind face a difficult task. Either they must attempt to evaluate every form and group proposed, which, if possible, would inject the personal element into the work; accept the word of the latest reviser, no matter how questionable this may appear; or steer a middle course, which lays them open to a charge of inconsistency. Anticipating criticism, the authors have kept fairly well to the middle of the road. They have been conservative in accepting changes in the genera and higher categories, and have refrained from accepting some of the most questionable of the new subspecies. They have, in general, however, adopted species and subspecies without question, and, while this is a necessary procedure in a list compiled by only two men, the results are not entirely happy. The acceptance of forms without careful scrutiny gives chief importance to lateness of publication, and the last word is not always the best word. Students differ in their evaluations of characters and variations, and to accept all or even most of the forms proposed is to represent no one's opinions of the composition of some genera. Perhaps no harm is done by this procedure, but one may venture the suggestion that the list would be of even more value if the names were more authoritative. This could be accomplished by a committee on nomenclature of the American Society of Ichthyologists and Herpetologists.

The second edition is quite free from typographical and other minor errors. We note a misprint in the footnote reference to *Natrix fasiata confluens* Blanchard: the type locality is in Missouri, not Michigan, as stated. A subspecies which was apparently missed is *Diadophis amabilis modestus*. In the case of *Chrysemys marginata bellii* the variety name antedates the specific name, so that the two forms should be known as *Chrysemys bellii bellii* and *Chrysemys bellii marginata*.

Herpetologists will be pleased that such a necessary work has been so well done and will not be slow to acknowledge their debt to the authors.

ALEXANDER G. RUTHVEN
MUSEUM OF ZOOLOGY,
UNIVERSITY OF MICHIGAN

## LABORATORY APPARATUS AND METHODS

### THE EMANATION METHOD FOR RADIUM

IN order to make accurate radium analyses or to calibrate a beta-ray electroscope, it is customary to use the emanation method as developed by Schlundt and Moore,[1] and Lind.[2] This involves a boiling off of the emanation from the radium solution, after which it is sealed and allowed to stand from several days to a month in order to allow the emanation to grow. Various methods of sealing have been used in the past with more or less success. If great accuracy is not desired, and the sample is only allowed to stand several days, fairly good results can be obtained by using a one-holed rubber stopper carrying a glass tube. The glass tube is surmounted by a short piece of pressure tubing which can be closed by a Hoffmann pinchcock. It is somewhat safer to draw out and seal off the glass tube, but best of all if the glass tube is sealed directly to the flask and then drawn out and sealed off.

An alternative method which might be suggested would be to seal a large bore stopcock to the flask directly, and keep the stopcock well seated by means of a special stopcock clamp. A heavy saturated stopcock grease would have to be used to prevent the formation of striations and resultant leaks. This method would have the advantage of requiring no glass blowing, once the flask with stopcock was made. It would have all the disadvantages ordinarily encountered with stopcocks.

When using sealed glass tips, the tip must be broken off after the flask has been connected by means of tubing to the emanation gas burette. The flask is usually warmed slightly, after which the tip is broken off and the gas boiled over into the burette. Experience has shown that the small end of glass is frequently projected toward the burette and lodges in the lower stopcock, thus preventing further operations, causing the loss of a sample, and even resulting in a serious explosion in case the operator fails to observe that the path has been obstructed.

Dr. Lind[3] suggested placing a plug of platinum

[1] *J. Phys. Chem.*, 9, 320 (1905); Trans. Am. Elect. Chem. Soc., 21, 471 (1912).
[2] *J. Ind. and Eng. Chem.*, 7, 1024 (1915).
[3] *L. c.* 7, 1027 (1915).

foil in the tube ahead of the stopcock to stop the tip, and later adopted a large bore stopcock so that the tip would pass through. Since large bore stopcocks are in general not as gas tight as the small bore, the author several years ago suggested the use of a simple inner seal in the tube placed ahead of

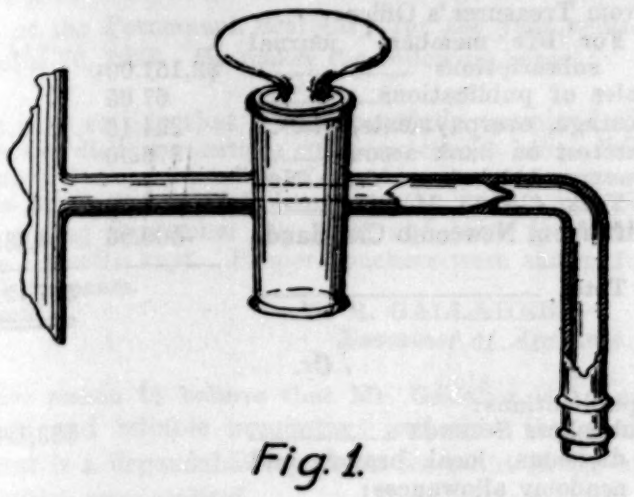

Fig. 1.

the stopcock (Fig. 1.). This method was adopted by the Radium Station of the United States Bureau of Mines, of which Dr. Lind was at that time director, and is being made. Certain objections have been raised to the small hole necessitated by the inner seal, with the result that an alternative model which has cross pieces of glass rods in the tube, as shown in Fig. 2, has been placed on the market.

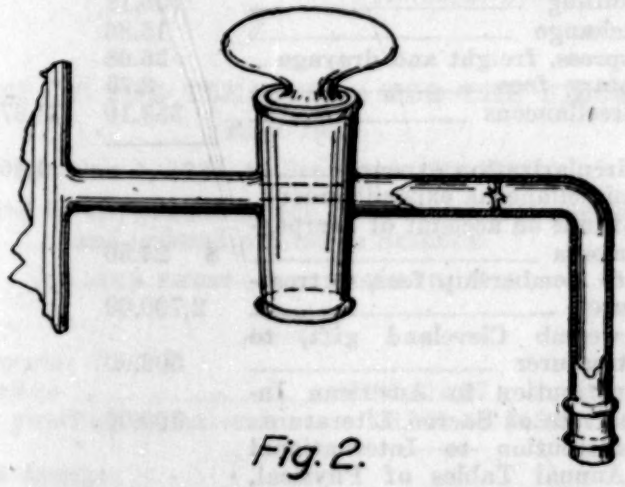

Fig. 2.

Both these types involve rather fragile parts unless well annealed and would be rather difficult for the amateur to make. The device indicated in Fig. 3 is simple to make and will effectually stop all glass tips, since they are carried naturally in a straight line and will drop back to the flask after spending their energy in the trap A. The angle is given in order to increase the difficulty of the tip passing the point A and arriving at the stopcock. The bulb at A is made short enough to insure the possibility of completely removing all gases from it during the boiling-off process. It is made by sealing off one leg of a T-tube close up to the joint.

The importance of allowing the emanation to grow in a glass sealed vessel is better realized when we remember that, even though we seal the flask under reduced pressure (easily done by inserting the stopper while the solution is still steaming) a very minute leak in the stopper may, in the course of several days or weeks, allow the pressure in the flask to become equal to the pressure outside. Thus far no emanation will have been lost, but if the flask now stands for

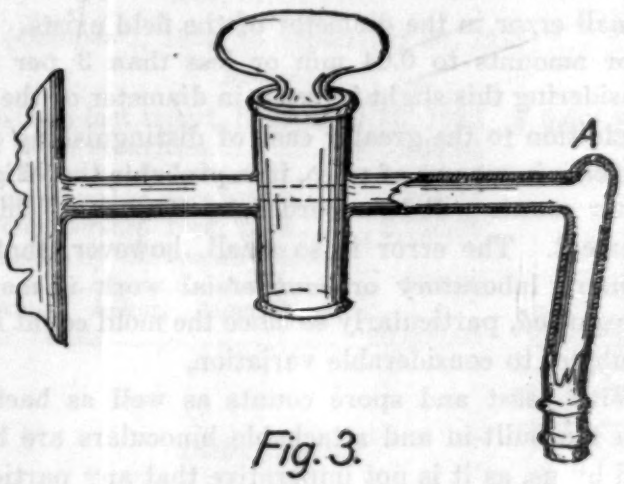


Fig. 3.

several days more, the barometric pressure may vary from day to day, and the temperature of the flask from day to night. The combined effect of these two may cause an excess of pressure of as much as ten centimeters of mercury within the flask. Such a pressure would in certain cases be sufficient to actually raise the stopper from the flask and allow the free passage of the gases to the outside. These conditions actually exist and become evident when we attempt to calibrate a beta-ray electroscope by means of standardized pitchblende, carnotite or radium solutions. With rubber stoppers and tubes closed with pinchcocks the most erratic results are obtained. When we resort to sealing the solutions in glass, the discrepancies disappear.

We are, therefore, forced to resort to breaking a glass tip, and, as a result, to eliminate the possibility of the tip obstructing the stopcock. The device described above does this successfully without involving a constriction, an air trap or fragile apparatus.

FRANK E. E. GERMANN
DEPARTMENT OF CHEMISTRY,
UNIVERSITY OF COLORADO

## USE OF THE BINOCULAR MICROSCOPE FOR MOLD AND YEAST COUNTS

THE undersigned, while applying the Howard count for molds and yeasts and spores to frozen and canned berries, jams and tomato products, found that the use of a binocular compound microscope, preferably the built-in model, rather than the attachable one, was admirably adapted for this work. With

mold counts eye-strain was reduced to a minimum and the stereoscopic effect, producing a greater depth than a monocular microscope, made it much easier to discern the mold in masses of fruit pulp.

As a field of 1.382 mm diameter is specified, it was found that a Bausch & Lomb binocular microscope of 163 mm tube length, with × 10 eyepieces and 16 mm objective, gave a field of 1.422 mm diameter. Therefore, for all practical purposes, a binocular microscope of this type can be used. It is recognized that a small error in the diameter of the field exists. This error amounts to 0.04 mm or less than 3 per cent. Considering this slight increase in diameter of the field in addition to the greater ease of distinguishing mold filaments in masses of pulp, it is probable that slightly higher counts will be recorded by the use of this instrument. The error is so small, however, that for ordinary laboratory or commercial work it may be disregarded, particularly so since the mold count itself is subject to considerable variation.

With yeast and spore counts as well as bacteria, both the built-in and attachable binoculars are being used by us, as it is not imperative that any particular magnification be used. For this reason the error just discussed relative to the mold count is irrelevant in this case.

Daylight was found to be preferable for mold counts, but checks with daylight counts were secured with electric light and the use of a disc of cobalt glass below the condenser. For yeast and spore counting the writers prefer artificial light, as it can be better controlled than daylight. It may be noted here that no particular form of light is designated in the latest edition of the "Methods of Analysis," of the Association of Official Agricultural Chemists.

GEORGE H. NEEDHAM
CARL R. FELLERS
UNIVERSITY OF WASHINGTON

## THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

### AUDITED FINANCIAL REPORT OF THE PERMANENT SECRETARY FOR THE FISCAL YEAR, 1923

(October 1, 1922, to September 30, 1923)

Approved by the council at the third Cincinnati meeting and ordered printed in SCIENCE

*Dr.*

| | | | |
|---|---|---|---|
| To balance from last account: | | | |
| Checking account | | $1,078.40 | |
| Savings account: | | | |
| Emergency | $4,497.68 | | |
| Publication fund (for Proceedings) | 1,500.00 | 5,997.68 | $7,076.08 |
| To receipts from members: | | | |
| Annual dues, previous to 1922 | | $ 82.00 | |
| Annual dues for 1922 | | 840.00 | |
| Annual dues for 1923 | | 51,755.00 | |
| Annual dues for 1924 (paid in advance | | 290.24 | |
| Entrance fees | | 935.00 | |
| Life membership fees | | 2,695.00 | |
| Associate fees | | 65.00 | 56,662.24 |
| To other receipts: | | | |
| From Treasurer's Office: | | | |
| For life members' journal subscriptions | | $2,151.00[1] | |
| Sales of publications | | 67.65 | |
| Postage, overpayments, etc. | | 294.16 | |
| Interest on bank account | | 276.30 | |
| Unexpended balance from New York (1916) Meeting | | 97.53 | |
| Gift from Newcomb Cleveland | | 500.00 | 3,386.64 |
| Total | | | $67,124.96 |

*Cr.*

| | | | |
|---|---|---|---|
| By publications: | | | |
| Publishers SCIENCE | | | $33,199.78 |
| By divisions, local branch and academy allowances: | | | |
| Divisions | | $1,357.00 | |
| State College (Pa.) local branch | | 29.00 | |
| Affiliated academies | | 1,440.00 | 2,826.00 |
| By Expenses, General Secretary's Office | | | 98.45 |
| By Expenses, Washington Office: | | | |
| Salaries | | $8,779.35 | |
| Office and addressograph | | 230.40 | |
| Printing and stationery | | 1,346.14 | |
| Telephone and telegraph | | 175.57 | |
| Postage, correspondence and billing | | 756.12 | |
| Exchange | | 15.86 | |
| Express, freight and drayage | | 36.68 | |
| Notary fees | | 2.75 | |
| Miscellaneous | | 333.10 | 11,675.97 |
| By circularization expenses | | | 1,469.54 |
| By miscellaneous expenditures: | | | |
| Refunds on account of overpayments | | $ 23.80 | |
| Life membership fees, to treasurer | | 2,700.00 | |
| Newcomb Cleveland gift, to treasurer | | 500.00 | |
| Contribution to American Institute of Sacred Literature | | 100.00 | |
| Contribution to International Annual Tables of Physical, Chemical and Technological Data | | 200.00 | |
| Boston (1923) Meeting: | | | |
| General expenses | $1,099.41 | | |
| Preliminary announcement | 1,490.00 | 2,589.41 | |
| Los Angeles (summer, 1923) meeting | | 219.75 | |
| Travel expenses | | 2,365.68 | |
| Section expenses | | 165.21 | |
| Grants committee expenses | | 36.44 | 8,900.29 |
| | | | $58,170.03 |
| By new balance: | | | |
| Checking account | | $ 180.95 | |

[1] Includes $1,107.00 on 1924 account.

| | | | |
|---|---|---|---|
| Savings account: | | | |
| Emergency | $6,273.98 | | |
| Publication | 2,500.00 | 8,773.98 | 8,954.93 |
| | | | $67,124.96 |

AUDITOR'S REPORT

I have employed Mr. W. R. Gallaher, an accountant at the Interstate Commerce Commission, to go over the accounts of the Permanent Secretary for the year ending September 30, 1923. He makes the following report:

This is to certify that I have carefully examined the receipts and disbursements in currency, checks, etc., of the Permanent Secretary's office of the American Association for the Advancement of Science for the twelve months' period ending September 30, 1923, and have found the records correctly kept. Proper vouchers were shown for all disbursements.

(Signed) W. R. GALLAHER,
*Examiner of Accounts*

I have reason to believe that Mr. Gallaher is an experienced and reliable accountant and that the above statement is a dependable report on the state of the accounts which were audited.

Very truly yours,

(Signed) ROBERT B. SOSMAN,
*Auditor*

Washington, November 26, 1923.

A general statement regarding the finances of the Association for 1923 has appeared in SCIENCE for January 25, 1924, page 84.

BURTON E. LIVINGSTON,
*Permanent Secretary*

## REPORT OF THE TREASURER FOR THE FISCAL YEAR 1923

(October 1, 1922, to September 30, 1923)

Approved by the council at the third Cincinnati meeting and ordered printed in SCIENCE

BALANCE SHEET—SEPTEMBER 30, 1923

*Assets*

| | | | |
|---|---|---|---|
| Investments: | | | |
| Securities | $107,814.77 | | |
| Cash awaiting investment | 23,131.18 | | $130,945.95 |
| Current Assets: | | | |
| Cash in bank | | | 6,871.29 |
| | | | $137,817.24 |

*Liabilities*

| | | | |
|---|---|---|---|
| Endowment Funds: | | | |
| General: | | | |
| W. Hudson Stephens | $ 4,381.21 | | |
| Richard T. Colburn | 84,155.74 | | |
| Friends of Association | 3,559.00 | $92,095.95 | |
| Sustaining membership | | 6,000.00 | |
| Life memberships | | | |
| 441 at $ 50 | 22,050.00 | | |
| 58 at 100 | 5,800.00 | 27,850.00 | |
| Jane M. Smith | | 5,000.00 | $130,945.95 |
| Current Liability: | | | |
| Newcomb Cleveland donation | | 500.00 | |
| Available appropriations, 1923 | | 825.00 | |
| Jane M. Smith Fund | | 300.00 | 1,625.00 |
| Unappropriated Interest | | | 5,246.29 |
| | | | $137,817.24 |

CASH STATEMENT

(October 1, 1922, to September 30, 1923)

*Receipts*

| | | |
|---|---|---|
| Balance from last report, September 30, 1922 | | $ 5,668.94 |
| Interest from securities | $ 5,166.63 | |
| Interest from bank balance | 14.30 | |
| 15 life membership fees, 1922 | 1,500.00 | |
| 27 life membership fees, 1923 | 2,700.00 | |
| Contribution by Newcomb Cleveland | 500.00 | |
| Redemption, Acker, Merrall & Condit bonds | 20,000.00 | 29,880.93 |
| | | $35,549.87 |

*Disbursements*

| | | |
|---|---|---|
| Grants: | | |
| S. M. Zeller | $250.00 | |
| John T. Buchholz | 125.00 | |
| Albert R. Sweetser | 125.00 | |
| A. W. Rowe | 300.00 | |
| S. A. Mahood | 200.00 | |
| V. C. Allison | 150.00 | |
| Ferdinand Cann | 250.00 | |
| Taisia Stadnickenko | 200.00 | |
| H. V. Atkinson | 200.00 | |
| M. S. Fleisher | 200.00 | |
| O. F. Kampmeier | 100.00 | |
| Linus W. Kline and Gertrude L. Carey | 300.00 | |
| S. L. Pressey | 200.00 | |
| L. Thompson | 100.00 | |
| F. B. Hanson | 250.00 | |
| W. W. Campbell | 225.00 | $3,175.00 |
| Subscriptions to SCIENCE: | | |
| For 1923, 348 subscriptions | $1,044.00 | |
| For 1924, 369 subscriptions | 1,107.00 | 2,151.00 |
| Two emeritus life membership fees, from Jane M. Smith Fund | | 200.00 |
| Rental of safe deposit box | | 20.00 |
| Expressage and insurance on bonds | | 1.40 |
| | | $ 5,547.40 |
| Cash in banks: | | |
| Awaiting investment | $23,131.18 | |
| Drawing account | 6,871.29 | 30,002.47 |
| | | $35,549.87 |

SCHEDULE OF SECURITIES

| *Par Value* | | *Purchase Value* |
|---|---|---|
| $10,000 | Chicago & Northwestern Railway Co. General Mortgage 4 per cent. bonds, due 1987 | $ 9,425.00 |
| 10,000 | Atchison, Topeka & Santa Fe Railway Co. General Mortgage 4 | |